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TELEPHONE TRANSMISSION THEORY and PRACTICE
Chapter IX
By Robert A. Clark, Jr.
Page 13

SWITCHBOARD MAINTENANCE
Part IV
By C. K. Brown
Page 16

HELPFUL LITTLE THINGS IN THE TELEPHONE EXCHANGE
By Ray Blain
Page 22

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Kellogg announces Kellac, a new JUMPER WIRE which will interest every telephon
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22 B & S Gauge tinned or tinned-enamel copper wire. Two wrappings of silk are appl
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- The superior flame-proofing qualities of Kellac— have been thoroughly demonstrated in laboratories actual use — lie in the cellulose acetate lacquer a union which it makes with the wrappings. Unlike o jumper wire, no flame-proofing salts are used, yet thi cial lacquer compound resists flame. A piece of Jumper Wire, held in a horizontal position, does not co to burn after an applied flame has been removed.

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IN THIS ISSUE

"Tapping In" on Washington . . Roland C. Davies 11

Telephone Transmission—Theory and Practice . . . Chapter IX . . . . . Robert A. Clark, Jr. 13

Switchboard Maintenance—Part IV . . C. K. Brown 16

Helpful Little Things in the Telephone Exchange . . . . . Ray Blain 22

Monthly Telephone Station Barometer 24

Items from Texas . . . . . J. A. Smith 25

The Coaxial Cable Crosses Jersey 28

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THE TELEPHONE INDUSTRY in 1935—

- **Employed 335,000 persons.**
- **Paid $427,000,000 in salaries and wages.**
- **Paid $104,000,000 in taxes.**
- **Paid $193,000,000 in dividends to 800,000 stockholders.**

SUCCESS STORIES

The boiled-down stories of business quoted on the opposite page were selected from hundreds of similar cases. They picture vividly how goods are moved by telephone. This advertisement appears in national magazines and business papers during October. Other firms may profit from these examples. The entire telephone industry should share the resulting toll traffic.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

TELEPHONE ENGINEER
MANAGEMENT - ENGINEERING - MAINTENANCE

OCTOBER, 1936

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

● The telephone investigation of the Federal Communications Commission will not be resumed until after the national election, despite the fact that the present funds for the inquiry will be exhausted by February 1 and there is still a large scope of subjects to be covered to comply with the Congressional resolution authorizing the probe.

But Washington is surcharged with politics, and until after the ballots in the presidential election are counted, the FCC and all other federal agencies are putting aside for the present all subjects of a controversial character. The Communications Commission had another reason for delaying the resumption of the telephone investigation hearings until after November 3, because it has been engaged in a lengthy and important technical hearing on the real location of the broadcasting facilities of the country. While this broadcasting hearing fell only in the province of the FCC Broadcast Division in its present stage, the subject was deemed of sufficent important to warrant the attendance of all seven commissioners.

What subject will come up first when the telephone investigation hearings are resumed is not yet known. Carl I. Wheat, the new associate counsel of the investigation, who is to take charge of the toll rate inquiry, probably will not be prepared to enter into those proceedings until later. Mr. Wheat is now engaged in surveying and studying the status and progress of the investigation. Because the former California commission attorney comes with a comprehensive and excellent background in telephone regulation affairs, members of the commission feel certain that he will direct the investigation along a more orderly and productive course than characterized it last Spring. Mr. Wheat, it is known, also will not conduct the proceedings in the ex-parte fashion which brought censure upon the previous hearings.

● At the outset of the resumption of hearings it is expected that Samuel Becker, now an associate counsel with Mr. Wheat, and Chief Accountant John H. Bickley will "clean up" remaining phases of the general investigation along the lines of the Congressional resolution. It is believed that these proceedings will precede any hearings on the toll rate inquiry. However, the subject of Bell System patents has been detailed by the commission to be conducted by a regular member of the FCC legal staff, William H. Bauer, who was formerly a patents legal expert of the justice department. The patents question previously had been under the direction of Mr. Becker.

FCC Seeks Funds . . .

An increased appropriation of $500,000 to enlarge its telephone regulation work is being sought by the FCC in its estimate of funds needed for the 1937-38 fiscal year (beginning July 1, 1937) which were recently presented to the budget bureau. The commission asked for an appropriation of $2,250,000 which is $775,000 more than the $1,474,000 allotment now being expended. Outside of $250,000 for a new ship radio inspection function, the major portion of the increase will go to increased telephone regulatory work.

An enlargement of the FCC accounting and engineering staff for telephone regulation functions will be a major item of expenditure under the new estimated appropriation, while undoubtedly the commission may seek to carry on its toll rate and depreciation and manufacturing costs investigation as a part of its regular work instead of through the special investigation appropriation. Such an increase might well obviate, too, the need of asking Congress for additional funds to continue the special investigation. Besides increasing the size of the staff, another plan is to establish district accounting offices for telephone regulation in the various geographical regions of the country. The creation of district offices would be following similar steps taken by the Interstate Commerce Com-

mission in its railroad and motor bus regulation.

● While the FCC feels that its request for increased funds is well justified, it is deemed most likely that the budget bureau will pare down this estimate of $2,250,000 by at least $250,000 and probably more. The prevailing reports in Washington indicate that no matter the result of the election a stiff governmental economy program is in the offing.

• ● •

Important Independent Case . . .

The most important jurisdictional case of an Independent telephone company, yet to be decided, has now been placed before the FCC Telephone Division—that of the Rochester (N. Y.) Telephone Corp.

The division heard recently a clear-cut and strong argument presented by the Rochester company in opposition to the conclusions reached by FCC Chief Examiner Davis G. Arnold, that the upstate New York Independent company was under control of the New York Telephone Co. of the Bell System and therefore should be adjudged under the entire jurisdiction of the Communications Act. The two major bases for the chief examiner's conclusions — that the Bell company exercised control because it owned and operated the toll exchange in the Rochester company's territory and because through its common stock and preferred securities' holdings it could veto certain corporate actions — met a stiff assault by the Rochester company through its counsel, T. Carl Nixon.

● In regard to the operation and ownership of the toll exchange by the Bell company to handle the Rochester company's toll traffic, it was cited that a simliar situation of toll board operation by the Bell company existed in 65 cities and towns in the United States where the Independent telephone companies oprated. Among the more important of such cities were Lincoln, Neb.; Erie, Pa.; Tampa, Fla.; Lima, O.; Muskegon, Mich; LaCrosse, Wis.; Santa Barbara, Cal.; Everett, Wash.; Newark, O., and Freeport, Ill. The Rochester company sought through this claim to refute testimony at the original hearing by an FCC engineer that Rochester was the only Independent telephone company with its toll board owned and operated by a Bell company. The commission was asked to reopen the examiner's hearing to permit further testimony by the Rochester company on the toll board situation. Mr. Nixon told the telephone division the company had been unprepared to treat the matter completely at the previous proceedings and furthermore had thought that it would not be treated with such importance as a basis of Bell control.

● Mr. Nixon also described the chief examiner's conclusion about Bell control over the Rochester company's corporate actions through its stock vote power as not actual control but only power over activities which had never been exercised and probably never would be exerted. The corporate actions, which included consolidation by Rochester company with another telephone carrier, leasing or selling its franchise rights, guaranteeing another corporation's bonds and increasing its capitalization, were pictured as "extraordinary" and "unusual" affairs. The New York Telephone Co.'s directors on the Rochester board, he cited, had approved a $6,090,000 additional issue of preferred stock and debentures for betterment of the plant 10 years ago. Only a small portion of these securities had been sold so that the Rochester company had a substantial backlog of authorized unissued securities which could be offered to the public in the future when such necessity arose. In the case of a merger the only telephone company with which the Rochester corporation could consolidate was the New York Telephone Co., while practically no corporation ever guaranteed the bonds of another company. Mr. Nixon also pointed out that the veto power through the minority common stock holdings of the New York Telephone Co. was a mandate under the New York state laws.

Another alleged basis of control—the voting privilege of the second preferred stock, entirely held by the New York Telephone Co.—was asasiled because this vote power only came when dividends on the preferred stock were defaulted. Mr. Nixon pointed out that even during the depression the Rochester company had paid these dividends and that it had enough surplus to pay it for 40 years or more even if its revenues were at the ebb point of the three depression years.

The telephone division is not expected to render a decision on the granting of a new examiner's hearing on the toll boar situation for two weeks or so. If the Rochester company is held subject to the FCC because of alleged Bell control, it is thought almost certain that the Independent company will take the case to the federal courts for the first test of the commission's jurisdiction over Independents under Section 2 (B) (2) of the Communications Act.

● In another company's case—the Garrett (Ind.) Telephone Co.—the telephone division did not follow the conclusions of Chief Examiner Arnold, but ruled that this Independent was under the control of the Indiana Bell Telephone Co. and therefore subject to the entire Communications Act. The Indiana Bell has a 50 per cent common stock ownership in the Garrett company, together with a substantial holding of bonds. The chief examiner had, however, concluded that it was not under Bell control. But the division found in an opinion and order that the Indiana Bell exercised actual control, chiefly because it had voted through its representatives on the board of directors for the payment of dividends during the depression partly out of surplus. The division noted that the Garrett company's surplus was small and could be easily exhausted if this practice was continued.

• ● •

Classifies Independents . . .

A number of other Independent companies, however, were classified as physically connecting 2-B-2 carriers by the telephone division. One was the Wabash Telephone Co., Bloomington, Ill., which is controlled by the Telephone Bond and Share Co., with a small minority common and preferred stock holding by the Illinois Bell. Another was the Pioneer Telephone group of 11 Independents in Minnesota in which the Northwestern Bell had a small minority financial interest. Both these classifications were made without hearings and were reached through correspondence.

Another important finding came in the case of the Sullivan (Ind.) Telephone Co., previously held subject because of a 1½ mile toll line running into Illinois. The Sullivan company sold this Illinois circuit and the division decided that with such a step no further federal jurisdiction remained. A similar situation existed in the case of the Standard Telephone and Telegraph Co. of Alabama which had a short interstate line into Florida.

● The first approval of an acquistion of another Independent telephone company's by an Independent carrier came during the past month from the telephone division when the purchase of nine exchanges and 255 miles of toll pole line by the Southwestern Assosciated Telephone Co. of Texas from the Western Light and Telephone Co. was approved. The sanction came without any hearing on the acquisition. The Southwestern Associated Co. purchased exchanges in Texas, Oklahoma and Kansas through the transaction.

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New Broadcast Tariff . . .

The American Telephone and Telegraph Co. has published new tariff cov-

(Please turn to page 26)

Telephone Transmission
Theory and Practice

By ROBERT A. CLARK, JR.

CHAPTER IX

The characteristics of telephone apparatus as affecting transmission is discussed in this chapter. Equipment for providing both telephone and d-c telegraph facilities on the same wires is described.

● We will devote our discussion in this chapter to telephone apparatus commonly used in local battery and common battery exchange systems, also equipment used for simultaneous telephony and d-c telegraphy. As we are primarily concerned with the transmission characteristics of this equipment, only those features having to do with this problem will be included in the diagrams and discussion. There are innumerable special features such as enter into signalling and supervising which have little or no bearing on the transmission properties of the circuit; these features we will not consider.

Fig. 45 shows a typical local battery telephone connected through an exchange to a toll circuit. Signalling is accomplished both on the telephone side and the toll side by ringing on the line. The telephone subset circuit shown in the figure is widely used in local battery exchange systems. However, it is being superceded with the anti-side tone circuit shown in Fig. 46. This has the advantage of greatly reducing the **side tone** or pickup received at the subscribers own station. This mitigates the deleterious effect of room noise and permits reception in noisy locations without the necessity of a switch to cut out the transmitter.

● The theory of the anti-side tone circuit should be thoroughly understood as it applies in many telephone problems. The principle of operation is shown in Fig. 47; it is the same as the Wheatstone relay used in the polar duplex telegraph system described in Chapter VIII (September issue) except that alternating current flows instead of direct. The network is made equal to the line characteristics as near as practical and the transformer so connected that under this condition the direction of the a-c voltages resulting from operation of the transmitter are in opposition as shown in the diagram. When the line and network are equal the currents flowing into two branches are equal in magnitude and therefore the voltage drops across the line and network are also equal. The voltage

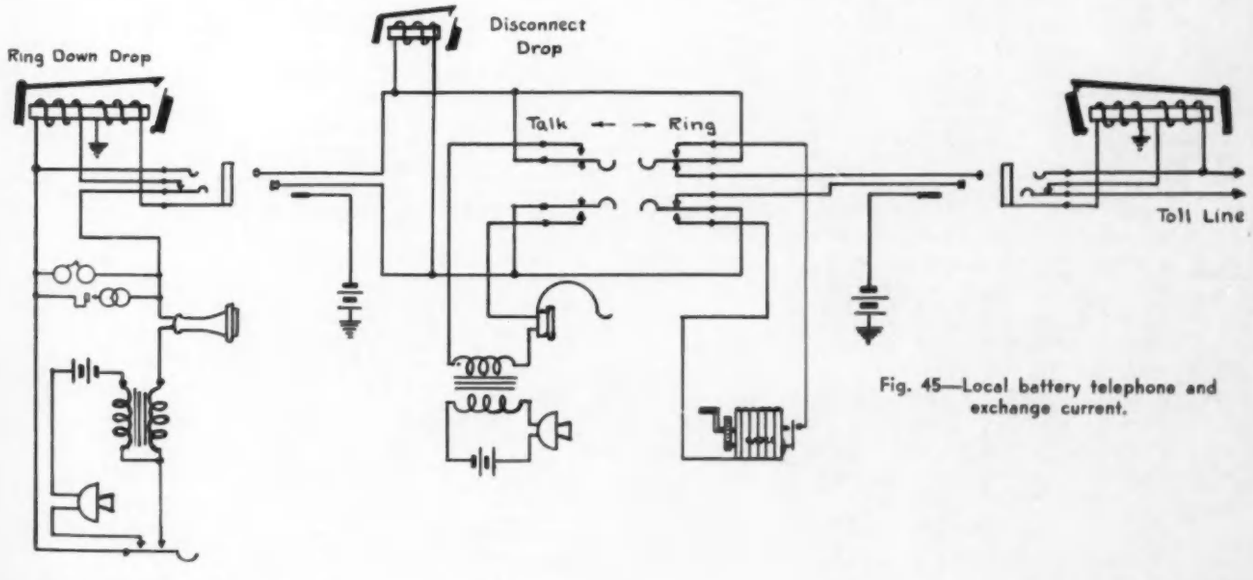


Fig. 45—Local battery telephone and exchange current.

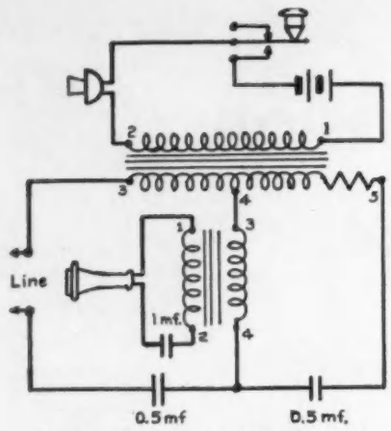


Fig. 46—Anti-side tone local battery telephone circuit.

drop across the receiver under such conditions is zero and therefore no sound is heard in the receiver when the transmitter is spoken into. In practice it is impossible to make the network exactly equal to the line at all frequencies and we have a small amount of feed back; however, the reduction in side tone is very material.

On reception, the incoming energy divides, part passing to the receiver and part to the network. By properly designing the receiver or by using an impedance matching transformer as shown in Fig. 46 the majority of the received energy can be delivered to the receiver.

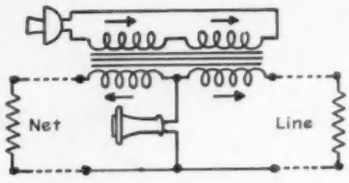


Fig. 47—Theory of anti-side tone circuit.

● Where a large number of local battery stations are bridged on a long telephone line, certain modifications in the subset are required in order that excessive loss will not be introduced when the receiver is off the hook and the set used to listen on the line. Fig. 48 shows the connections for such a subset; this type being commonly used on long telephone circuits such as in train dispatching. It is necessary to close a switch in order to talk on the line. When the switch is in the up position, the receiver is connected in such a way that the bridging loss is very small.

The circuit of a typical common battery telephone and exchange is shown in Fig. 49. This diagram shows a connection set up between a toll circuit and a local battery telephone. Supervision is obtained by relays which operate on direct current flowing

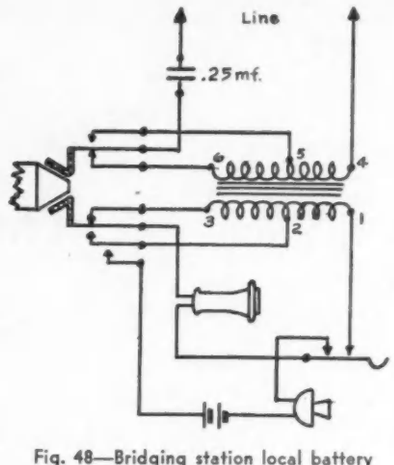


Fig. 48—Bridging station local battery telephone circuit.

through the subscribers subset. Signalling on the toll side may be had by means of a ring down relay similar in principle to that used on a local battery exchange. There are a great many modifications of toll circuit signalling; however, the ring down relay is simple and reliable and has most of the features necessary for operating a few toll circuits in connection with a small local battery exchange. The circuit of the subset shown in the figure embodies the anti-side tone feature described above.

As previously mentioned, simultane-

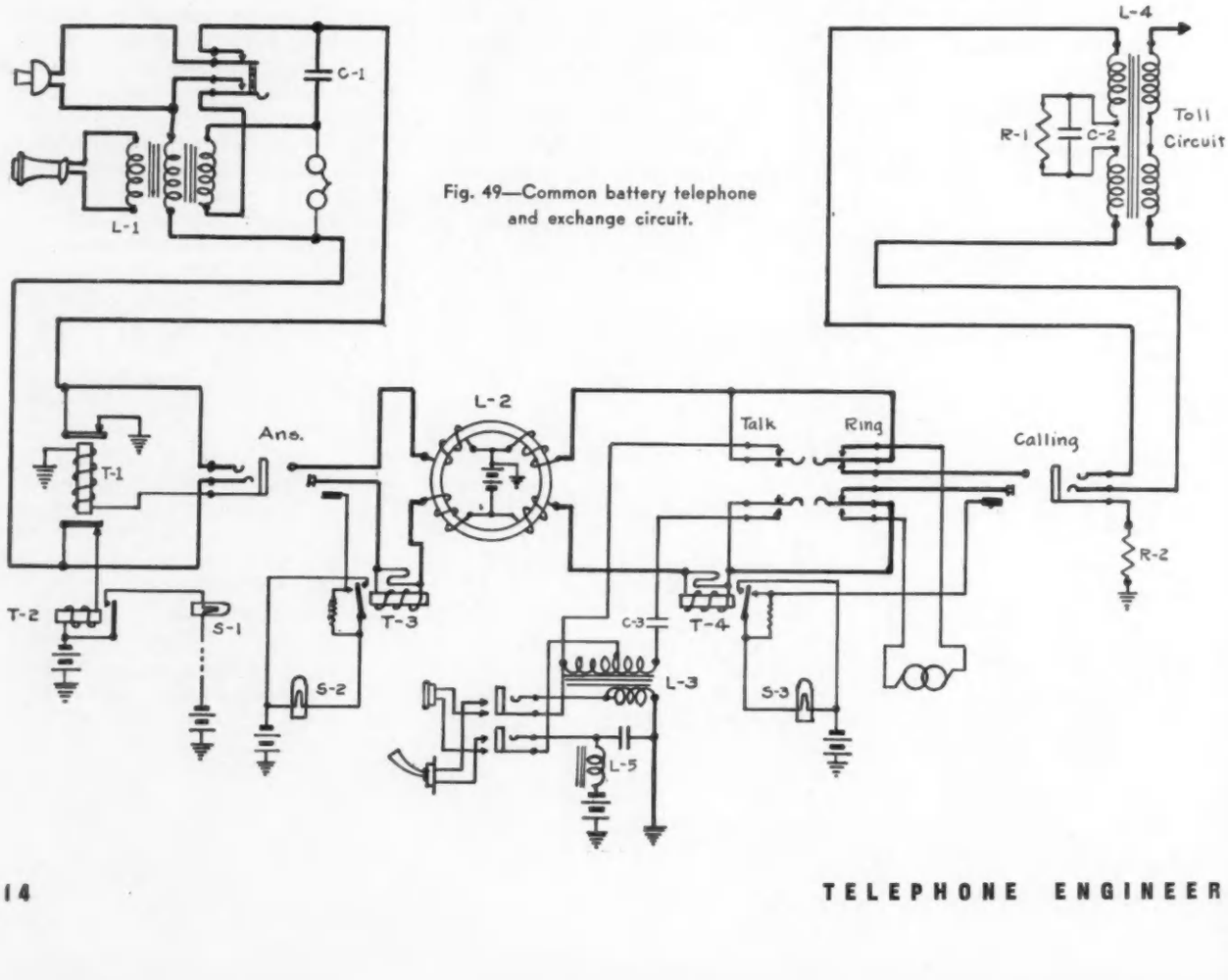


Fig. 49—Common battery telephone and exchange circuit.

ous telegraphy and telephony may be obtained over the same pair of wires. With the equipment shown in Figs. 50 and 51, one telegraph circuit may be obtained in addition to the telephone; this is known as a **simplexed circuit.** The connections shown in Fig. 50 employ a repeating coil; the connections shown in Fig. 51 employ an impedance coil and condensers. The impedance coil must have sufficient inductance to cause no appreciable bridging loss on the telephone circuit. In general, a coil of about five henries is suitable. In some cases such as on telephone circuits employing a-c selector signalling which utilize a frequency of about three cycles per second the inductance of the bridging coil must be much higher and should be in the neighborhood of about 70 henries. Either type of circuit is quite suitable; the advantages in favor of one or the other depends more or less on local conditions.

A simplex telegraph circuit on a well balanced telephone line may be operated up to speeds of 30 or 40 cycles without difficulty. It is highly desirable to keep the line current less than about 60 or 70 ma. in order to prevent tele-

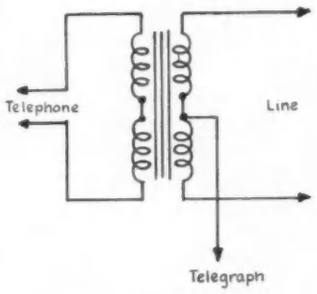


Fig. 50—Simplex telegraph circuit with repeating coil.

phone interference. Line unbalance will generally cause noise and telegraph induction on the telephone circuit which may fluctuate with the current. However, with the current limited as above and reasonably well balanced lines no interference may be expected.

● Two telegraph circuits in addition to the telephone circuit may be derived by means of the circuit shown in Fig. 52. This equipment is known as a **composite set.** The telegraph circuits obtained from a composited line are not as satisfactory as those from the simplex previously described; the large capacity necessary to reduce the interference on the telephone circuit tends to distort the telegraph signals and prevent operation at line speeds more than about 15 cycles per second. There is some possibility of improvement in this equipment and I see no reason why, in the future, line speeds of 20 cycle cannot be obtained over long cir-

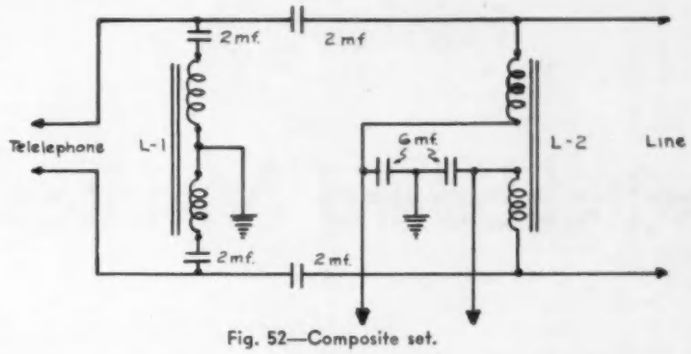


Fig. 52—Composite set.

cuits. There are several modifications which can be made in the composite set some of which materially improve the operation of the telephone circuit in some cases and have little or no effect in others; for example, the ground on coil number 1 may be lifted, materially reducing the noise in the telephone circuit. In some cases this coil and the four 2mf condensers may be replaced with a repeating coil having one 2mf condenser in the mid-point on the line side with material benefit as to noise and Morse thump.

It is essential that all condensers and inductance coils be carefully balanced otherwise noise and Morse interference will be experienced on the telephone circuit. The two 2mf series condensers must be balanced to a high degree, generally within less than one per cent. However, conditions seem to vary and in some cases considerable unbalance can be tolerated whereas in others slight unbalance seems to cause appreciable noise. This is particularly true when the composite set is used on phantom telephone circuits.

● We come now to the discussion of the transmission properties of the previously described apparatus. Before discussing the characteristics of the apparatus we might consider briefly the telephone transmission problem as a whole. If we had only an isolated telephone line which was at no place near to power or other telephone lines, several problems would be eliminated. However, this is not generally the case and we must take into consideration

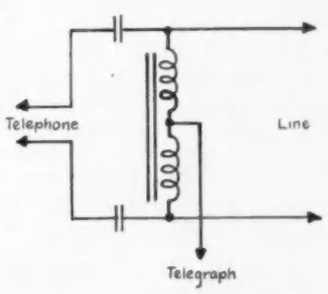


Fig. 51—Simplex telegraph circuit with retard coil.

the interaction between telephone circuits and also the effect on the telephone circuit of neighboring power lines.

Starting with the transmitter, we know that when it is spoken into the voice energy is converted into electrical energy composed of frequencies ranging from about 100 to several thousand cycles. We also know that for reasonably intelligible transmission, the lines and equipment must pass a frequency band from about 200 to 2,000 cycles. Experience indicates that the response of the transmitters, receivers and other equipment should be uniform within about 6 or 8 db over this entire range. We also know that the ratio of receiving energy to transmitted energy should not exceed about 30 db. It is desirable where practical, to keep this limit down to 20 db. These values are on the basis of using standard types of transmitters, receivers and associated equipment. You might think it practical to increase the output of the transmitter and also the sensitivity of the receiver thereby permitting conversations over cricuits having an equivalent greater than 30 db. This would be entirely feasible if, as mentioned before, we had a circuit which was isolated from all other telephone circuits and not in proximity to any power lines. However, this is seldom the case and when we attempt to raise the energy level of the transmitter and increase the sensitivity of the receiver we run into many difficulties which make impractical this expedient.

● The transposition system for open wire lines commonly employed today provides adequate reduction of cross-talk and noise from paralleling power lines under normal conditions. However, if we attempt to raise the transmitter output appreciably, we find that the cross-talk becomes greater than permissible. Also if we increase the receiver sensitivity we find the same condition resulting. In addition, noise from parallel power lines which was tolerable in the cast of the standard receiver

(Please turn to page 18)

By C. K. BROWN

Switchboard Maintenance

Discussion of the problems of a series circuit as applied to the primary transmission portion of the attendant's circuit in P. B. X.'s is given in this installment

PART IV

● Practical problems consisting of a series circuit as applied to the primary transmission portion of the attendants telephone circuit as used in certain types of P.B.X. switchboards, are shown in Fig. 1.

A complete solution of this problem can be obtained by the application of Ohm's Law. The total resistance of the circuit, is the sum of the retardation coil, transmitter and induction coil, or $148 + 40 + 12 = 200$ ohms. The value of the current through the circuit is $I \frac{E}{R}$ or $14/200 = 0.070$ amperes. The voltage drop across the various portions of the circuit will be:

$E = I \times R$ or—

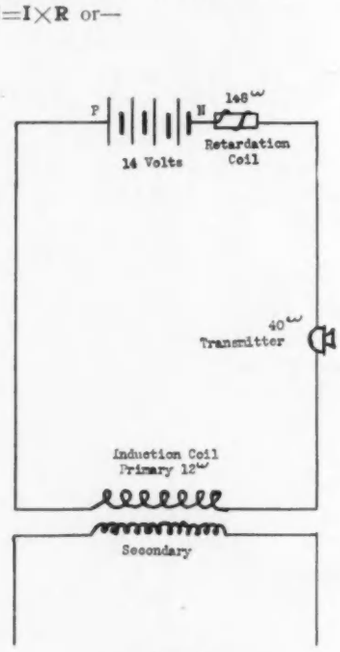


Fig. 1

Retardation coil
$E = I \times R$ or $.070 \times 148 = 10.36$ volts
Transmitter
$E = I \times R$ or $.070 \times 48 = 2.80$ volts
Induction Coil
$E = I \times R$ or $.070 \times 12 = 0.84$ volts

Total 14.00 volts

It should be noted that the sum of the respective voltage drops across the individual pieces of apparatus equals the voltage at the terminals of the storage battery. In this problem the internal resistance of the storage battery was neglected. This can be done with very little error entering into the calculation when the source of E. M. F. is a storage battery, since its internal resistance is extremely small, therefore, it's effect is relatively slight.

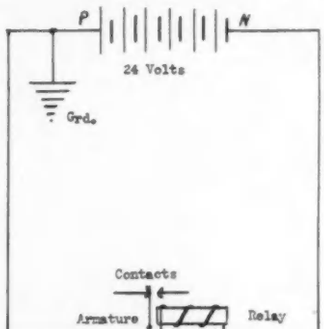


Fig. 2

Fig. 2 shows a typical parallel circuit consisting of two common pieces of P. B. X. switchboard apparatus connected to a storage battery. The value of the current through each part of the circuit will be as follows:

$I \frac{E}{R}$ or the relay equals $24/500$ or 0.048 amperes. Non-inductive resistance is $24/300$ or 0.080 amperes.

● By non-inductive resistance is meant, a resistance in which there is no effective magnetism produced. In the above it was assumed that the conductors from the battery to the relay winding and non-inductive resistance had no resistance, which as a fact is not true, as Fig. 3 shows the same circuit (Fig. 2) at the end of a pair of conductors of 22 gauge copper wire 6.5 ohms each and connected in a series with the two winding of relay "L" to the battery as shown.

In this case is illustrated a combination of a series and parallel circuit, the equivalent resistance of the "Y" relay winding and non-inductive resistance joined in parallel is equal to 187 ohms, therefore, the total resistance of the circuit shown in Fig. 3 is $100 + 6.5 + 187 + 6.5 + 100$ or 400 ohms. The value of the current flowing is $24/400$ or 0.060 amperes. The E. M. F. across points

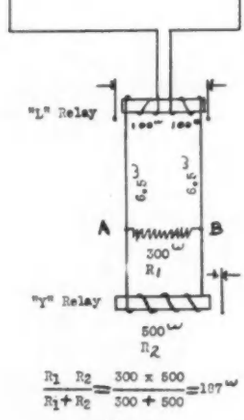


Fig. 3

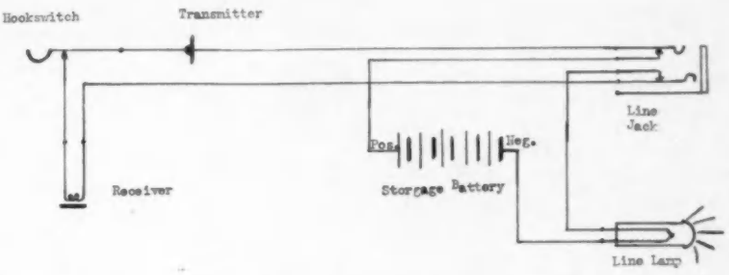


Fig. 4

"A" and "B" will equal the voltage at the battery less the drop in each conductor and relay "Y" winding. Voltage at the source is 24 volts.

● Voltage loss to "A" and "B" is 213 × .06 = or 12.8 volts. Voltage across "A" and "B" is 187 × .06 or 11.2 volts. The current through the relay winding and non-inductive resistance, respectively, is .0225 and .0375 amperes and when added up equals the total current of 0.06 amperes obtained by the first caculation. It is observed that the first step in calculating this type of P. B. X. switchboard circuit consists of reducing it to an equivalent series circuit. This enables the current value and various voltages to be calculated at once, after which the currents in the various branches can be determined.

A simple P. B. X. extension station signaling circuit in which an electric current is sent out over the subscribers line through a lamp at the P. B. X. switchboard is shown in Fig. 4. If the receiver is removed from the hook switch at the telephone, it is evident that the current will flow through the lamp, thus lighting the lamp. However, if the line circuit has a high resistance, the switchboard lamp will not burn as brightly as if it were connected in a low resistance line.

If the lamp is replaced in the circuit by the winding of a relay and the lamp connected in an auxiliary circuit, which will be closed by means of suitable contacts when the line relay electromagnet attracts a soft iron armature, we have the principle upon which most

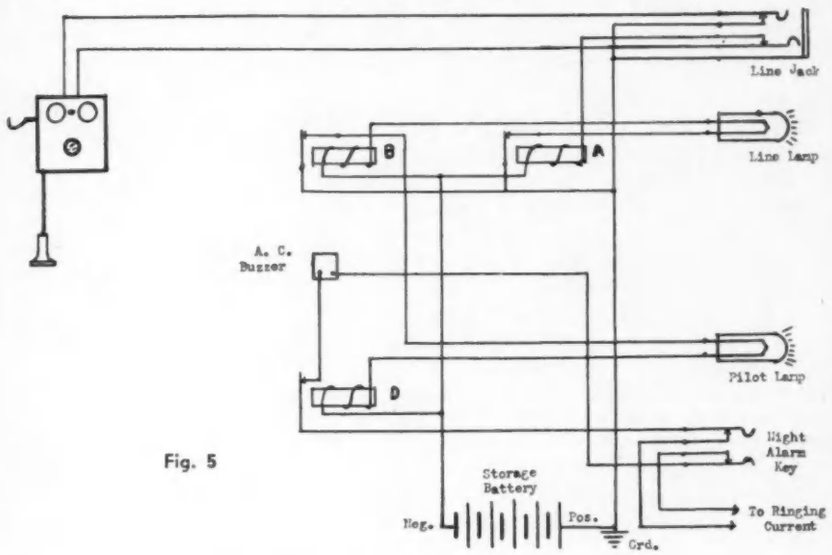


Fig. 5

P. B. X. extension station line circuits operate, called standard.

● Most of the things that go into the manufacture of P. B. X. switchboard apparatus called standard are based on experience. With respect to this it may be said that there is a certain fundamental relationship between research and standards. The former is generally an effort on the part of equipment manufacturers to improve upon existing standards. But P. B. X. design and manufacturing problems which are the subject of research today, probably will be in many instances, standards of the future, that is, after they have been proved and modified in service to the public. Figs. 5 and 6 illustrate two modern types of standard P. B. X. extension station line circuits.

A P. B. X. attendant is required for establishing connections between two switchboard extensions and also between a station and the central office. Establishing extension to extension call; an extension subscriber, removing the telephone set receiver from hook switch the line relay in Fig. 5, operates lighting the line lamp in series with the "B" relay. The "B" relay operated lights a line pilot lamp in series with the "D" relay. Should the night alarm key contacts be closed and relay "D" operated it will cause the night alarm bell to operate.

● The switchboard attendant answers the call by inserting the plug of a back (answering) cord of a pair into the line jack. This will open the inner

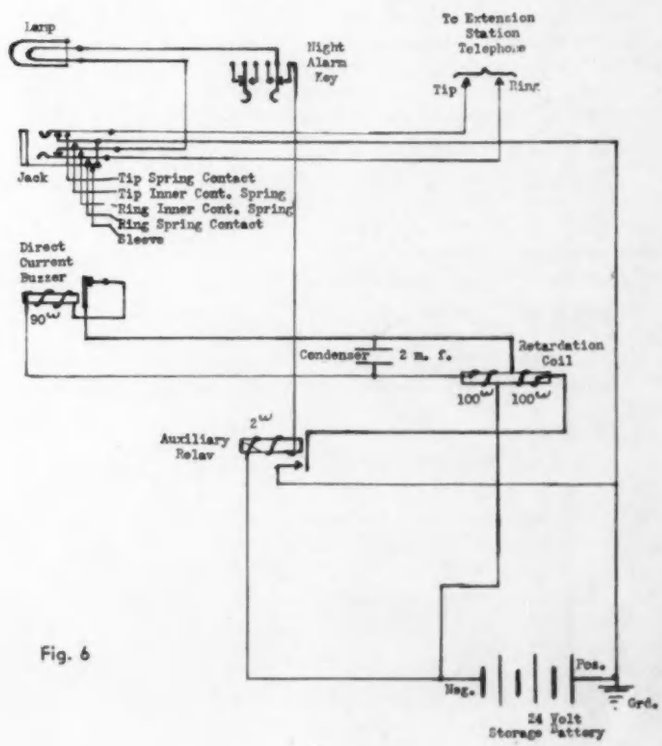


Fig. 6

contacts of the jack releasing the line relay and extinguish the line lamp, also releasing the "B" relay, which in turn extinguishes the line pilot lamp and releases the "D" relay.

In Fig. 6, when the receiver is removed from the hook at the extension station, it closes a circuit from ground at the positive terminal of the 24-volt storage battery, line jack tip inner break contact, to the tip spring through station telephone to the jack ring spring and ring inner break spring through the line lamp to the night alarm key contacts through winding of the auxiliary relay to the negative terminal of the 24-volt battery, thus lighting the line lamp and operating the relay.

The operation of the relay closes a circuit from the ground side of the 24-volt battery to the relay contact and armature through one of the retardation coil windings to the buzzer armature and contact, through the buzzer winding to the other winding of the retardation coil to the negative terminal of the battery and consequently causes the buzzer armature to vibrate and produce an audible signal.

● The retardation coil and a two micro-fared shunt (by path) condenser constitute an audible frequency filter. The purpose of this filter is to prevent cross inductive reaction from the buzzer circuit into the cord and other circuits in the P. B. X. switchboard, more especially if the P. B. X. receives its operating current from the central office battery.

In our study of P. B. X. practices so far, only the application of the principles of direct current have been considered. There are, however, two types of electric current used in the operation of P. B. X. equipment, namely, direct and alternating current.

Direct current is one which is uniform in value and always flowing in one direction, while alternating current continually changes in both its value and direction. The various principles and factors which are used in direct current calculations are also applied to alternating current, but in addition to these, there are also certain other factors which must be considered when dealing with alternating current.

(TO BE CONTINUED)

The first successful demonstration of Bell System radio telephony took place in 1915, when speech was transmitted from Montauk Point, Long Island, to Wilmington, Delaware, a distance of 250 miles.

Ecuador is the only country in South America that has no dial telephones.

Telephone Transmission Theory and Practice

(Continued from page 15)

becomes objectionable when a more sensitive receiver is used. Therefore, we find more or less by trial and error methods that there is a definite limit to the permissible output of transmitters and the sensitivity of receivers. This limit of course varies greatly with individual cases and the values given in the following paragraphs are only representative of general conditions. Often times it may be possible to take advantage of high output transmitters or supersensitive receivers to compensate for excessive loss on the telephone line. However, extreme care must be used, otherwise noise and cross-talk problems which can only be overcome at great expense will result.

The output of a transmitter varies considerably with the type and manufacture. It is somewhat difficult to make an exact test of the output as there are several variables such as current, position of transmitter, frequency, etc., which enter. However, a practical test can be made with reasonable accuracy after a little experience with the transmission meter described in Chapter VI. The meter is connected to the output of the subset and a steady audio tone is impressed on the transmitter. This can be accomplished by either whistling at about 500 to 800 cycles into the transmitter or speaking a tone such as ah. Another way is to use a receiver connected to the transmission oscillator described in Chapter VI. This is really the best way as the frequency band can be covered, thus giving a better idea of the transmitter operation. The output of the oscillator should be kept constant at a given value which must be determined more or less by experiment.

● The levels which are mentioned in the following paragraph are on the basis of using the above methods. I have found that for all practical purposes a whistle into the transmitter will give highly satisfactory results and is very simple. Some experimenting is required so as to obtain consistent results. However, once you learn how to use this method the transmitter can be quickly and accurately tested. The output of an ordinary telephone such as used in magneto and common battery exchanges is about +5 db. Many telephones will average 3 or 4 db below this value even when they are in good condition. Others will average 3 or 4 db higher than this. The output of the anti-side tone local battery telephone circuit shown in Fig. 46 will average about +12 db. The output of the bridging telephone set shown in Fig. 48 will average about +15 db.

The +15 db output is about as high as it is possible to go in output level without running into cross-talk, especially if there are appreciable amounts of cable or if there are any ground return rural circuits on the lead. Under certain conditions, such as on heavily exposed lines involving long power line parallels where the noise is very high it is practical to use higher level outputs than the +15 db limit mentioned above. These are more or less special cases and we will treat them more in detail when we discuss the problem of inductive interference. As a general rule no attempt should be made to increase the level above +15 db unless the possibility of cross-talk has been carefully investigated.

The average telephone receiver is sufficiently sensitive so that intelligible voice transmission will be had at levels of about −30 db to the subsets shown in Fig. 45, 46 and 49. The subset shown in Fig. 47 is less sensitive as the induction coil is so constructed as to give a high step down ratio. This reduces the bridging loss but also reduces appreciably the senstivity of the receiver; this reduction in efficiency is about 10 db.

● Receivers have been developed which have a sensitivity considerably higher than the ones commonly used. Some of these will average as much as 10 or 15 db better than the ordinary type. Under some conditions, this improvement is quite beneficial. However, in many cases this increase in sensitivity will raise the noise and cross-talk to such an extent that it becomes objectionable. As a general rule, I believe it more desirable to maintain high energy levels and keep the sensitivity of the receivers about where it is, because as time goes on there will be a tendency for the noise on the telephone circuits to increase rather than decrease. The construction of new power lines, especially those of the rural type, may be expected to keep the noise on most circuits at least as high as at the present time. It is doubtful whether or not improvements in power and telephone line coordination will materially reduce the average noise level and for this reason, I believe it more desirable to work toward a raising of the voice energy level rather than lowering it.

(TO BE CONTINUED)

Overseas telephone service is now available from any Bell or Bell-connected telephone in the United States to all the principal countries in the world except China, Russia and New Zealand.

ICE EQUIPMENT to Meet Every Need

FOR MANUAL SERVICE

Monotype Manual Switchboards offer the user of manual equipment the highest economy — both in first cost and in upkeep.

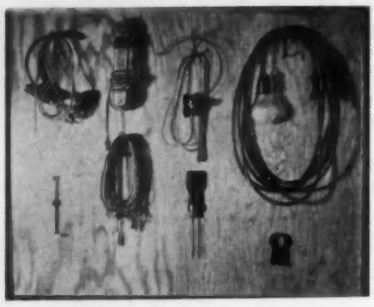
Steel frame construction—one of the many outstanding features of Monotype design — insures exceptionally long life with perfect alignment and accurate operation of all parts. This extra-rigid, extra-strength construction also means a minimum of maintenance — even under conditions of the most severe usage.

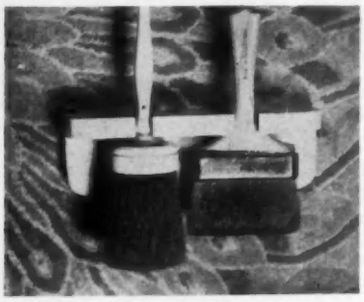
Besides this built-in durability, Monotype boards are provided with the latest circuits, relays of highest quality and proved reliability, and Monotype cords — noted for their exceptional wearing ability. Couple with this the beauty of the finest cabinet work, and you wonder how Monotype boards can be sold so reasonably! Certainly you pay no more for Monotype proved quality, than for products of ordinary or inferior performance — so why not investigate the Monotype line — at once? Write for further information.

E L E C T R I C

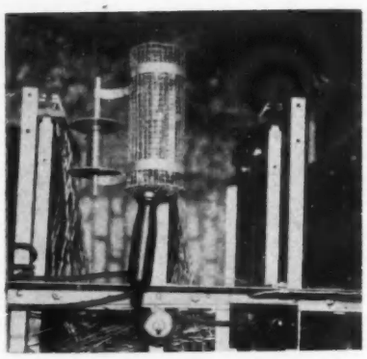
AND SIGNALING PRODUCTS

Export Distributors: AUTOMATIC ELECTRIC SALES COMPANY, LTD., Chicago





By RAY BLAIN



When any telephone exchange is neat and clean with everything in its place, proper maintenance is greatly simplified.

Helpful Little Things in the Telephone Exchange

● Telephone men always admire and strive for neatness and cleanliness in the proper regulation of the telephone exchange. We have yet to see a neat, clean exchange which was not also a well maintained one. Also when any exchange is neat and clean with everything in its place, proper maintenance is greatly simplified. Some may consider this a rather broad statement so we will hasten to qualify it in a convincing manner.

Be there a telephone man who has not at one time or another been in an exchange when an important fuse let go, and watched the mad scramble of all hands to locate a good fuse and restore service. Often a defective fuse will be found mixed with the good ones and naturally this delays things a bit longer. A simple, well stenciled, wall type fuse rack, with a complete set of replacement fuses will cost only a few cents and will be positive assurance against all future fuse confusion.

Then who has not witnessed a big hunt through a drawer of tools to locate the heat coil pliers when their need is urgent. Often the same difficulty is experienced in the location of a good heat coil or a new set of protector carbons when some poor lineman is near freezing at the top of a pole on a winter day. This problem may be solved in a most simple manner by mounting a small, four compartment metal tray on the main frame to separate good and bad carbons and heat coils and keep them always at hand. A small metal loop on one end of this tray will keep the heat coil pliers within easy reach at all times.

● Electric soldering irons we all agree are a wonderful convenience though they never present a neat appearance if left laying around on the ironwork of the mainframe in a haphazard manner. Damage to wiring or floor covering is often caused when hot soldering irons are left unprotected. Wire netting may be conveniently fashioned to provide a convenient and safe soldering iron holder for mounting permanently on the mainframe. This holder may be further improved by mounting a bracket on the under side to accomodate a roll of rosin core solder. If the completed fixture is painted with aluminum it will be found to blend well with all modern mainframes.

Good electric soldering irons are often ruined by workmen forgetting to turn them off when a job is finished. Also a person will often think the iron is turned on and when they attempt to use it, find that it's stone cold. All this trouble may be prevented by installing a suitable pilot light where it may be easily seen, to indicate when the current is on the iron. (See illustration on page 22.) This little pilot light may be combined with a suitable outlet and mounted on the ironwork of the mainframe. A small snap switch is considered a further improvement and causes less wear on the heater cord at the plug.

● It is a common sight in many telephone exchanges to see switchboard men scramble about for a test receiver when serious trouble occurs. Often when a receiver is located, perhaps in the bottom of a tool box, it will be defective and useless. In order to avoid these mad hunts and to keep the tools required frequently in good condition and where they may be located at all times, we advocate the installation of tool boards (see illustration on page 22) in all plant rooms and switchboard rooms. These boards need not be larger than 30 inches square in most cases,

(Please turn to page 30)

The Manufacturer's Bulletin Page

KEARNEY
Telephone Equipment News

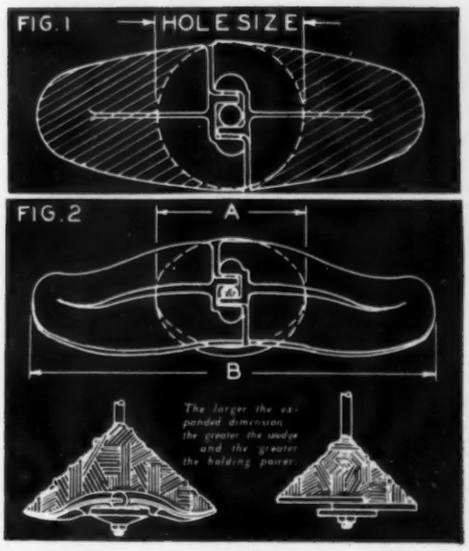
NEW PRODUCT INFORMATION

Latest News | St. Louis, Mo., Oct. 1936 | Phone Copy

OLD METHOD OF SELECTING EXPANSION ANCHORS QUESTIONED—THREE CONSIDERATIONS NOW RECOMMENDED

Selection of Anchors According to Overall Dimensions, Alone, Without Regard to Surface Areas, Unsatisfactory

Kearney Two-Way Anchor Found to Expand 2½ Times Its Rated Size — 63% of Its Area Contacts Undisturbed Earth



MANY operating engineers who formerly purchased expansion anchors according to nominal overall dimensions, alone, without regard to surface area are now basing their selections on these fundamental factors which determine holding power: (1) the proportion of the tota¹ area that directly contacts undisturbed earth; (2) its maximum expansion; (3) the anchor's total surface area.

In designing Kearney Expansion Anchors these very factors were taken into consideration. For instance, in Figure 1 the shaded part illustrates that portion of the blades of the Kearney Anchor which actually contacts undisturbed earth. Figure 2 diagramatically shows the ratio of the unexpanded dimension to the expanded dimension of the anchor. In the Kearney Two-Way Expansion Anchor, which expands 2½ times its rated size, 63 per cent of the area contacts undisturbed earth.

Blades Curvature

Another factor considered in the design of the Kearney Expansion Anchor is the specially designed blades. In Figure 3 the cross sectional view shows (a) blades breaking earth side walls; (b) blades following through original break; (c) continuing on original path without disturbing earth or causing side walls to crumble. By having blades of such design they are permitted to expand through their original arc without wedging effect—they permit easy installation—assure greater holding power without creepage once they are set. Superior strength of Kearney Anchors has been accomplished by making them out of Certified Malleable Iron.

The Kearney Corporation offers special service on anchoring problems to those seeking advice. Merely address the Anchor Department.

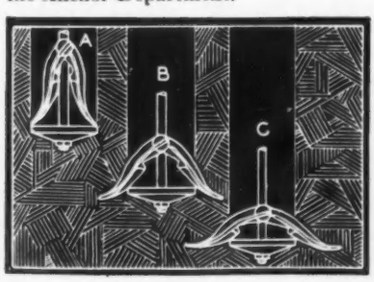


Fig. 3

SOIL CONDITIONS ARE DETERMINING FACTOR IN SELECTION OF SCREW TYPES OF ANCHORS

Better understanding, among construction men, as to the selection of the proper screw anchor for certain soil conditions has created an increasing demand for the anchors, such as shown below.

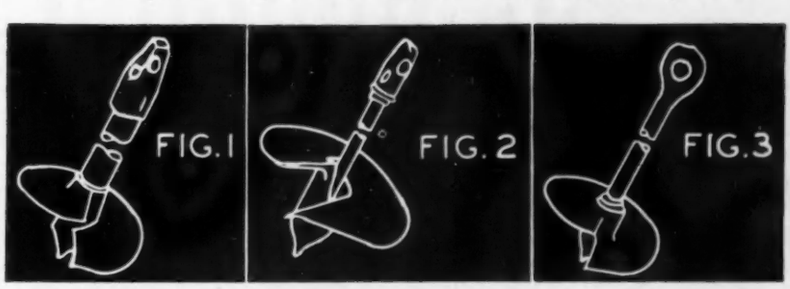
For instance, there has been a big demand for Kearney Pipe Rod Anchors (Figure 1) in regions where swamp conditions prevail. This anchor may be conveniently set through bog regions down as deep as 75 feet where more solid earth is found.

In clay and more compact soils, the Steel Rod Anchor (Figure 2) has met with favor since the special socket reinforcing shoulder on the anchor permits the use of ample turning power on the anchor wrench.

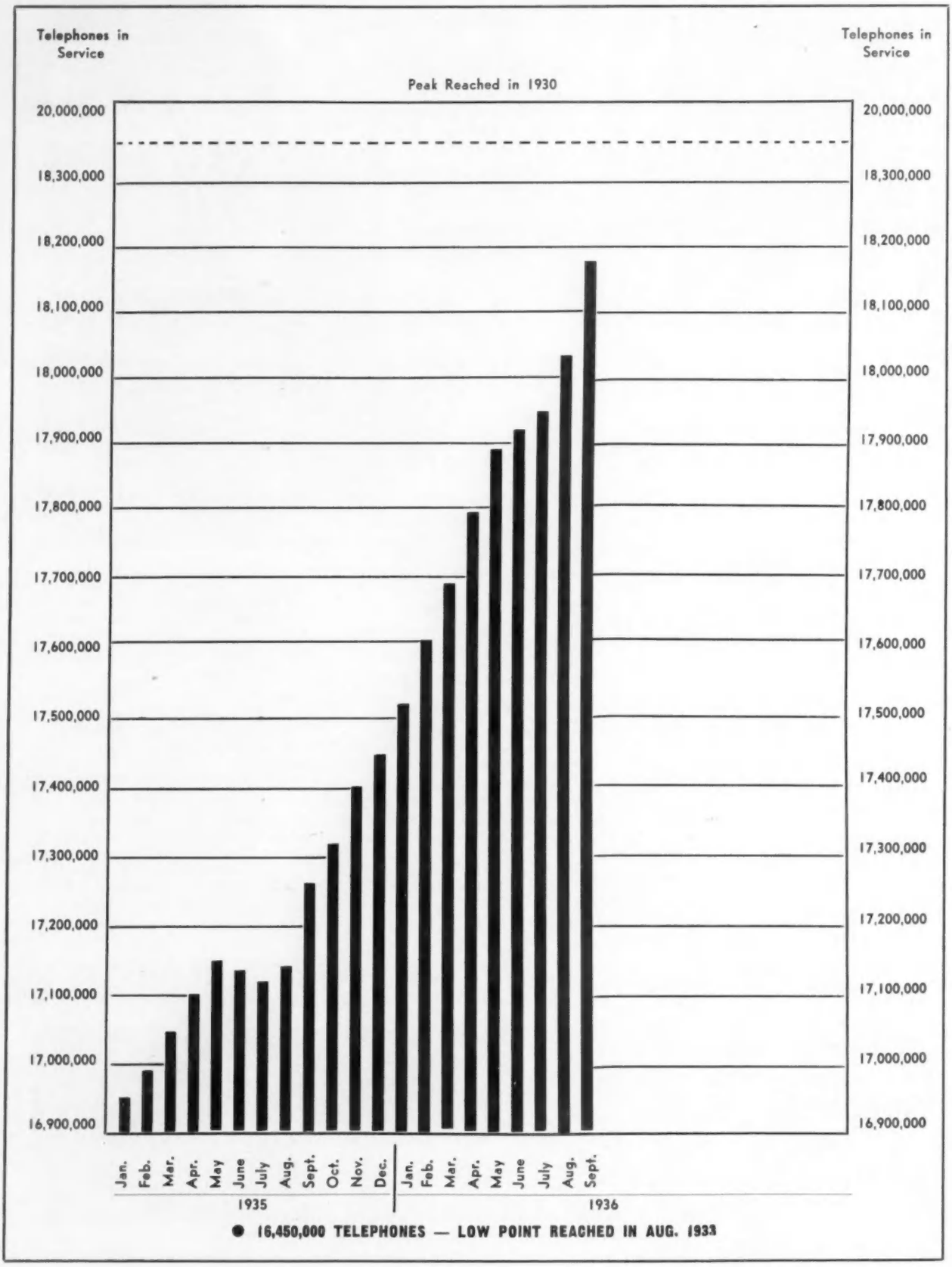
The No-Rench Anchor (Figure 3) is finding wide use where constructions call for temporary guying. This anchor, which is conveniently installed by use of a standard digging bar through the large eye, can be removed and salvaged as easily as it is installed.

Many operating men who have never used screw type anchors before have specified them after consulting the Kearney Anchor Department in regard to their specific advantages or disadvantages relative to the soils in which they are to be used.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Ave., St. Louis, Mo.—*Canadian Plant*, Toronto



Monthly Telephone Station Barometer



Items from Texas

By J. A. Smith

Gatesville is now enjoying the facilities of a new exchange installed by the Gulf States Telephone Co., of which Oscar Burton is president. The building was erected especially for the company and comprises the latest in architecture and convenience.

• ● •

El Campo is to have a new exchange building, according to announcement of the Southwestern Bell Telephone Co. It is to be of brick construction and will contain new switchboard and common battery equipment. More than $20,000 is being expended to fit this little city up with the best that money can buy.

• ● •

Recent rains played havoc with telephone communication in Texas but the exchanges effected are fast pulling out of their difficulties. San Angelo probably suffered more than any of the other cities. The rainfall for a term of 30 days was estimated by some as high as 25 inches.

• ● •

J. S. Cook of the Grapeland Telephone Exchange in that town, announces that a complete exchange and lines will be built soon, even the poles and wire are scheduled to be replaced. This exchange will be changed from magneto to common battery.

• ● •

Down at San Angelo "the thrill that comes once in a lifetime" was experienced by an operator in that typical west Texas city when a patron asked to put in a call to London. Nothing unusual in many Texas cities, but when it comes to the smaller cities it means that prosperity is on its way.

• ● •

Even the little town of Goldwaite informs TELEPHONE ENGINEER that it had its troubles on account of floods of the Colorado River, when a high of 45 feet was reported. Some flood, we'd say.

• ● •

New Switchboard equipment is being installed at College Station by the Southwestern Bell Telephone Co. College Station is near Bryan.

• ● •

New lines are being added to the Loraine exchange in order to accommodate new patrons of that city. Some of these lines extend to rural communities.

Dependable Service *with* LEICH Equipment

No. 90 C. B. Self Contained Telephone with Straight Line or Harmonic Ringer.

TELEPHONES COMMON BATTERY MAGNETO	SWITCHBOARDS COMMON BATTERY MAGNETO
CONVERTERS HARMONIC RINGING	BATTERIES DRY CELL STORAGE
RELAYS TELEPHONE SIGNAL SPECIAL APPLICATIONS	WIRE IRON, COPPER BRONZE, INTERIOR

● LEICH TELEPHONE EQUIPMENT is engineered to meet the needs of modern telephone service.

● New materials, new designs and careful workmanship assure you of satisfactory service from LEICH apparatus. Every piece of equipment which we sell has our unqualified guarantee of good service.

● If you have not used LEICH EQUIPMENT in your exchange you are missing the opportunity of getting the lowest maintenance cost. Ask the man who uses LEICH TELEPHONES for his experience.

Also a Complete Line of Telephone Construction Hardware

LEICH ELECTRIC COMPANY
GENOA, ILL.

TELEPHONE APPARATUS BACKED BY 30 YEARS' SERVICE

WINTER CRUISE

Hawaii

Cuba

WEST INDIES

"Where Summer Spends the Winter"

Amid brilliant sunshine, a profusion of riotous colored flowers, soft balmy trade winds rustling the Date and Royal Palm trees, nature is on her best behavior. But during the summer months, through the rainy season, terrific lightning and thunder storms occur.

The telephone companies in Hawaii, Cuba and the West Indies, have for many, many years, protected their plants with Cook Protected Pole Cable Terminals and Cook Central Office Protection. There are more than 2,000 Cook Protected Terminals installed throughout the islands of the Hawaiian group.

For a real severe job, experience has proven you can rely upon Cook Protective Equipment.

Insist on Cook.

COOK

Electric Company

CHICAGO

Illinois Has Biggest Convention in Years

● The 32nd annual convention of the Illinois Telephone Association was one of the best attended meetings ever held by that association. More than 500 telephone men and women of Illinois and neighboring states signed the register. Then, too, the number of manufacturers and suppliers exhibiting at the convention was reported to be greater than at any other Illinois annual meeting.

The reasons for the big attendance wasn't difficult to find when one looked over the practical character of the program. The sessions were as practical and profitable in actuality as promised prior to the convention.

Telephone leaders point to this activity as a true indication that the telephone industry in the Sucker State is definitely back on the road of recovery and that it will continue the upward trend in the future.

The following officers were elected to serve for the ensuing year:

President, C. R. Brown, Springfield, vice-president in charge of operations, Illinois Commercial Telephone Co.; vice-president, Harry A. Joslyn, Sycamore, president and general manager, DeKalb-Ogle Telephone Co.; secretary-treasurer, A. J. Parsons, Springfield; and general counsel, Ben B. Boynton, Springfield.

Following are the newly elected directors of the association:

C. R. Brown, Springfield; Donaldson Coombes, St. Louis, Mo.; A. S. Crane, Jacksonville; E. D. Glandon, Pittsfield; Dr. R. E. Gordon, El Paso; J. G. Hardy, Springfield; H. A. Joslyn, Sycamore; J. I. Kennedy, Freeport; H. G. Lankford, Chicago; R. A Lumpkin, Mattoon; C. F. Melick, Eureka; Louis Pitcher, Dixon; Paul J. Ramsey, Chicago; R. G. Roadstrum, Galesburg; Dr. J. G. Schwarz, Jerseyville; Earl Stice, Altamont; and R. B. Still, Bloomington.

President R. G. Roadstrum of Galesburg opened the convention and following the invocation by the Rev. William L. Essex, rector of St. Paul's Episcopal Church of Peoria, he introduced City Attorney James F. Wolfenbarger, who gave the address of welcome. R. B. Still of Bloomington responded.

● President Roadstrum gave his annual address, in which he reviewed the past year's activities of the association and paid tribute to the various groups and individuals whose work aided the association in rendering service to the telephone companies of Illinois.

Ben Boynton, general counsel of the association, delivered an excellent address in which he explained the details of and voiced objections to the Federal Social Security law and the influence it will have on the telephone industry.

As always, Secretary-Treasurer Parsons gave an interesting report on the work of the association. He stressed the benefits received from the district meetings held during the year; the activity of the Illinois Independent Toll Clearing Co., and paid high tribute to Mrs. Mayme Workman, association traffic supervisor, for her work in assisting Independent chief operators throughout the state. Mr. Parsons reported that the association was in sound financial condition.

Also on the program were prominent telephone leaders including F. B. MacKinnon, president, United States Independent Telephone Association, whose subject was "National Affairs"; George Price Ellis of Wolfe & Co., public accountants of Chicago, who spoke on "Business at the Crossroads"; J. Howard Mathews, chief engineer, Illinois Commerce Commission; O. M. Westrup, auditor, Illinois Consolidated Telephone Co., who discussed "The Importance of Telephone Accounting"; and Dr. O. E. Buckley, director of research, Bell Telephone Laboratories, New York City. Dr. Buckley's subject was 'Some Illustrations on Research in Telephony".

"Tapping In" On Washington

(Continued from page 12)

ering its services in broadcast program wire transmission to become effective November 1, which is expected to end major complaints from the broadcasting industry against the telephone company's regulations and practices. The broadcasting service by the A. T. & T. was a subject to be probed by the FCC telephone investigation which had sent out a questionnaire to all broadcasting stations during the mid-summer seeking complaints about rates, practices and service.

• ● •

Telephone Use By Railroads . . .

The telephone is steadily being used more and more in railroad train dispatching and transmission of orders in place of the telegraph, so the Telegraph and Telephone Section of the Association of American Railroads has reported. Because of its greater flexibility and more direct means of communication, the telephone is gradually supplanting the telegraph on the railways, it was indicated. In 1935 it was used on 63.53 per cent of the railroads or 148,799 miles as compared with telegraph utilization on 92,466 miles. In 1620 the telegraph was used on 51.5 per cent of the railroads.

Bell System Installing Much New Equipment

Recovery in the Bell System has assumed proportions, it was indicated recently in a newspaper release, where replacement of outmoded equipment with new facilities is going on apace.

There is every indication that the system will finish the year with the total number of telephones on its lines within striking distance of the all time peak of 15,583,101 units interconnected at the close of 1930.

The system is going along with its program of substituting up-to-the-minute equipment for older facilities, as the load in any given area makes expansion essential. The replacement process is running at levels well in excess of any previous recovery year.

It is expected the end of the current year will reveal the company to have added between 750,000 and 800,000 telephones or stations. This would bring the total stations in the system to around 14,600,000, or slightly above that figure, indicating that the system has recaptured some 1,400,000 of the 2,420,000 connections lost in the depression, when a low point of 13,162,000 phones was reported at the close of 1933.

John Winn Elected General Telephone President

John Winn of Albany, N. Y., has been elected president of General Telephone Corp. to fill the vacancy in that office which has existed for several months, it has been announced.

Mr. Winn is a native of Boston and has been connected with the telephone business since 1910. He was with the New England Telephone & Telegraph Co. until 1917 when he entered the Army and served overseas as a captain of artillery. Following the war he joined the engineering staff of the New York Telephone Co., being located first in New York City, and for the past 10 years in Albany.

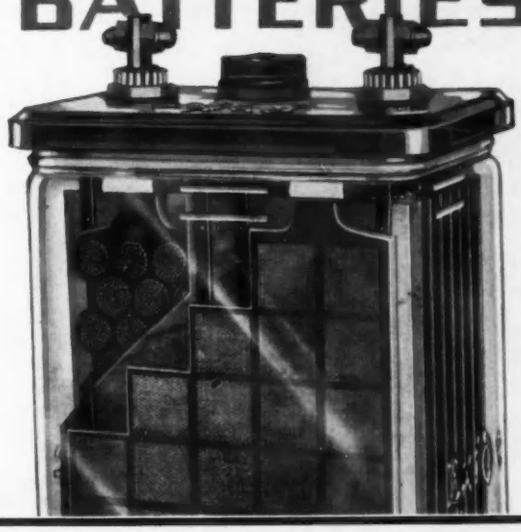
Mr. Winn will assume his new duties November 2.

Telephone Jacks Inherit Name From Telegraphy

The holes in telephone switchboards, into which the operators plug their answering cords, are known as "jacks." The term "jacks" came from the earlier art of telegraphy, since the first jacks were used in telegraph equipment and were so called because they had movable parts arranged like those in a jack-knife. In fact, they were called jack-knife switches.

Exide

BATTERIES



Assured Power For Peak and Emergency Loads

Exide Batteries are always ready to deliver power when it is needed most—*during peak and emergency loads on exchange equipment.* They deliver power to the full extent of their capacity.

Modern telephone service requires modern exchange equipment with its common source of battery power. The operation of Exide Batteries used in common service will not be interfered with by interruptions or fluctuations in the A.C. circuits. During emergencies they will help to keep the majority of your lines in service.

There is an Exide Battery for every telephone job —common battery, emergency reserve, signaling, or P. B. X. Wherever the utmost dependability, long life and freedom from care are the determining factors in the selection of storage batteries for telephone service, Exide Batteries are invariably chosen.

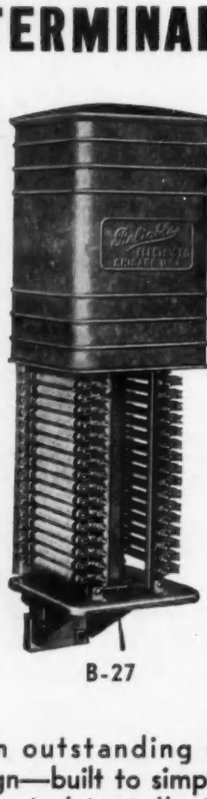
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

Reliable

PROTECTED CABLE TERMINALS



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An outstanding design—built to simplify terminal installation and maintenance, and to outlast the cable. Made in three types for three standard cable terminal fuses.

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Reliable Electric Company
CHICAGO

The COAXIAL Cable Crosses Jersey

● The "coaxial" cable, recent development of the Bell Laboratories, will soon be given actual field tests over a line now under construction across New Jersey, according to the monthly publication of the New Jersey Bell company. The test, engineers say, may lead to a revolutionary change in the way voice highways are built.

The new coaxial cable, unlike the ordinary cable which often carries hundreds of wires packed in a lead sheath the size of a man's wrist, contains only two wires to carry conversations. It is less than an inch thick, and the two wires, far from being packed together, are supported in separate copper tubes.

But the size of the cable belies its ability. Engineers anticipate that it will carry the volume of calls of a large size standard cable, at least 200 separate conversations at once, without danger of interference. And, more important, the peculiar design of the new cable is expected to enable it to carry much higher electrical frequencies than standard telephone circuits.

In effect the new cable, which has unobtrusively been pushing its way across New Jersey from New York to Philadelphia for the last several weeks, contains twin coaxial cables for voice traffic in each direction. Each coaxial circuit consists of a tubular outer conductor of copper, and inside a single wire suspended within the tube by a series of disc insulators. The circuit is formed between the inner surface of the tube and outer surface of the wire. These two coaxial conductors are contained in a lead sheath.

● Extreme care is being taken in placing the cable to avoid possibility of damaging it. Where rivers intervene, a heavily-armored coat covers the cable before it is lowered to the bottom of the stream bed. Recently the Hackensack and Passaic rivers were successfully negotiated in this manner. For most of the rest of its route the cable runs underground. Along its route at regular intervals it passes through special repeater "booster" stations, where tubes much like those in a household radio receiving set restore the electric voice impulses to normal strength to carry them on to the next station. The repeaters are placed at intervals of about ten miles.

This coaxial cable system, with its cable and specially designed terminal apparatus, writes M. E. Strieby, Bell Telephone Laboratories engineer in a recent issue of that organization's Record, is expected to transmit speech or signal currents of frequencies as high as a million cycles. Since a band of less than five thousand cycles is sufficient for telephony this million-cycle coaxial line should provide over 200 voice channels. At the sending end of the cable system conversations from 200 telephone lines can be gathered together and placed on the single coaxial line; and at the receiving end of these 200 conversations must be separated and sent out over 200 different circuits to their respective destinations.

● The cable is being placed for the Bell Telephone Laboratories by the Long Lines Department of the American Telephone and Telegraph Co., with the sanction of the Federal Communications Commission, for experimental purposes to determine whether the expectations of the scientists who developed it will work out in practice. Communication engineers throughout the world are interested in the results, but none is able to predict what the radical change in voice cable construction may accomplish. The ability of the cable to carry higher frequencies may enable it to play an important part in the transmission of television programs between broadcasting stations, for example, much in the manner that high quality telephone lines now link radio broadcasting stations to form the great national radio networks.

Bell Telephone Securities Unit Out of Existence

Bell Telephone Securities Co., which handled the distribution of millions of dollars worth of American Telephone & Telegraph stock to small investors on a monthly payment plan several years ago, passed out of existence September 1.

Dissolution of the company was authorized by A. T. & T. directors "some time ago," and the formality was completed recently. The company discontinued its partial payment stock selling plan several years since when the Bell Telephone Securities has been inactive.

Asks Authority To Issue $250,000 New Stock

Authority to increase its capitalization about 50 per cent, or more than $250,000, by an additional issue of 13,900 shares of no-par common stock with a declared value of $18.36 per share, has been asked of the Ohio utilities commission by the Mansfield Telephone Co.

With past issues totalling 30,000 shares of no-par common, the present capitalization of the company exceeds $550,000, based on the declared value fixed for the additional issue.

The additional issue would reimburse the company for expenditures amounting to $256,947 for extension of lines during the past five years, LeRoy R. Wittemire, general manager of the company, explained.

"During the past five years the company has made a number of extensions, adding to the company equipment and property," Wittemire commented. "We are now asking authority to capitalize further, in the amount of the cost of these additions."

Rebuilding of exchanges at Adario, Shiloh, Bellville, Butler, and Lexington constituted a part of the extensions and additions which prompted the request for authority to sell additional stock, the manager said.

Other work for which the company seeks reimbursement in this manner includes extensive installation of underground conduits and cables, and erection of aerial cables, Wittemire explained.

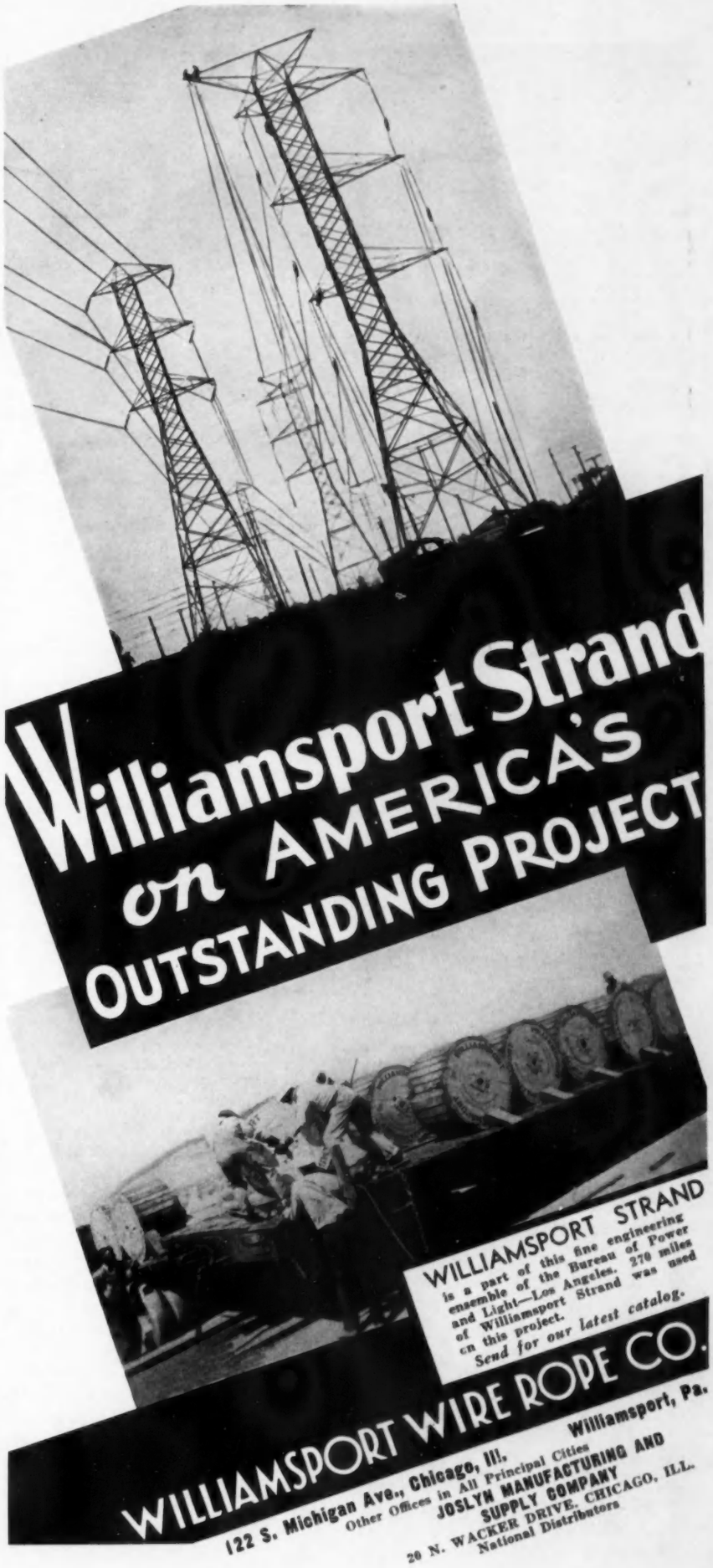
H. L. Harris Elected Governor of N.E.M.A.

H. L. Harris, president of the Automatic Electric Co., has been elected to the Board of Governors of the National Electrical Manufacturers Association, known as N.E.M.A., for a period of three years.

The telephone industry is a section of N.E.M.A. which was the supervisory agency of the electrical manufacturing industry during the time the N.R.A. was in operation. The association has a membership of 500, consisting of the principal electrical manufacturers in this country.

The election of a telephone man as governor of the Association is a recognition of the importance of the telephone industry as a section of the electrical manufacturing association.

The longest telephone call possible entirely within the United States is from Eastport, Me., to Bay, Calif., a distance of about 2,950 air-line miles.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To the final steps of rigid inspection and testing, each pair of pliers that carries the Klein trademark represents the maximum in plier quality.

Klein methods viewed in the light of modern mass production are necessarily more costly.

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Helpful Little Things in the Telephone Exchange

(Continued from page 22)

and should be equipped with special hooks and fixtures to adequately hold all necessary tools. A combination handset should always be available for its need is varied and frequent. One test receiver with cords and clips and another of the same type but with a small three-cell flashlight battery connected in series with the cords and the receiver, should be available. With these two receivers, various tests may be made on both battery and dry circuits.

A tool board should, in our opinion, always contain a good rubber extension cord of proper length to reach all parts of the equipment. This cord should be equipped with a rubber covered male plug on one end and a weatherproof socket on the other. Some prefer an insulated guard over the light bulb while others prefer to use the bulb without the guard so that it may be better used in confined spaces.

● A set of several patch cords four to six feet long with a test clip on each end will have numerous uses around any exchange. Should a wire in a cable form go open, one of these cords may often be used to make temporary repairs. Two of these cords may sometimes be used until time permits the running of a permanent jumper on the mainframe. Spring benders, screwdrivers and other tools suited to the needs of the particular exchange and used frequently may be mounted on the tool boards to good advantage.

Proper cleaning and dusting of delicate and expensive telephone equipment, always deserves careful consideration. No matter what special cleaning apparatus is available in an exchange, the use of good dust brushes can never be advantageously eliminated. Dusting around the plugs on the key shelf of a manual switchboard is one of these places where a good brush always proves its worth. When I started telephone work the old feather duster reigned supreme and it was far inferior to the present dust brush. Dust cloths are always messy and catch on everything, neither do they effectively remove dust except on a flat surface. Cleaning cable forms and the rear of power panels is another brush job. They may likewise be used effectively in cleaning switches and circuit breakers on the face of a power board.

While brushes are a necessity only those of good quality should be considered for use in the telephone exchange. Cheap inferior brushes prove more expensive in the long run for it is surprising the extremely low cost at which superior brushes may now be purchased. We prefer that dust brushes used in the exchange be non-metallic, that is, no metal or other conducting material of any kind shall be used in their construction. This feature prevents all possible trouble from accidental contact with current carrying equipment.

● The round type painter's duster is a convenient brush for use in the exchange. This should also always be of good quality with soft black fibre center. The outside should be a mixture of black hair and fibre. The brush part of this duster is usually about 2½ inches in diameter and 3⅜ inches in length. Draftsmen's dusters of either grey horse hair or pure chinese bristles, cement set, also serve many useful purposes in the exchange. The brush part of this duster is about nine inches long and 2¾ inches in width.

A four-inch flat brush is always useful in the exchange for various types of cleaning. For this, we prefer camels hair, vulcanized in rubber with a special composition binding. The bristles are about 1¾ inches long. The same type brush with black bristles may be obtained if a less expensive article is desired.

To keep brushes in good condition and always available we suggest the installation of a simple wall rack as indicted in the photograph on page 22. This rack will cost very little and greatly prolong the life of the brushes by keeping them in good condition and available for instant use at all times.

The simple features here suggested have all been tested and tried out in actual use and we believe that they will prove as beneficial to you, as they have for us if, you only give them a chance to do so.

Southwestern Bell Seeks Four Missouri Companies

The Southwestern Bell Telephone Co. has asked the Missouri Public Service Commission for authority to purchase four telephone systems near St. Louis.

Systems sought by the company are the Machens-West Alton Telephone Co., Grover Telephone Co., operating in rural St. Louis and Franklin counties, Chesterfield (Mo.) Telephone Co., and the Kampville (Mo.) Telephone Co.

The applications pointed out the properties had been offered for sale at an aggregate figure of $25,952.

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LENZ is introducing a new cord, with even better insulation and wearing qualities, that will substantially reduce cord costs.

The new Lenz cellulose acetate textile insulation, of improved moisture-resisting and body acid-resisting qualities, will greatly increase cord life.

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ADVANCED DESIGN HOISTS

Reading from left to right the hoists are: Model A or F, ¾ ton or 1½ tons; Model AT or FT, 1½ tons or 3 tons; Model Z 4½, 4½ tons; Model Z, 6 tons.

Telephone linemen find the Model A ¾ ton Coffing Hoist, weight 14 lbs., invaluable for stretching guy wires, messengers, underground cables, etc.

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. . . that's what every telephone engineer seeks . . . *more hours of service* . . . which means fewer replacements, lower service costs! And that's exactly what Ray-O-Vac telephone batteries offer!

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MAIN OFFICES AND PLANT
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Additional Factories at Clinton, Massachusetts and Lancaster, Ohio

B. R. Snyder Promoted By Associated

Promotion of B. R. Snyder, former Muskegon (Mich.) exchange wire chief of the Michigan Associated Telephone Co., to plant engineer has been announced by company officials.

In his new position Mr. Snyder will spend much of his time traveling throughout lower Michigan directing construction in various exchanges.

E. L. Swartz, formerly of Automatic Electric Co., has been named Mr. Snyder's successor in Muskegon.

Telephone's Inventor Had Many Phones in His Home

Every so often a story goes the rounds that Alexander Graham Bell, inventor of the telephone, ultimately turned against his own invention and would not have a telephone in his own home.

This is entirely contrary to the fact. Indeed, Alexander Graham Bell was one of the first persons to have his home adequately and thoroughly equipped with phone service. Dr. Bell had a telephone in every room of his house in Washington, D. C., except his private study and the parlor. So, too, with his summer home in Cape Breton Island, Nova Scotia, where he had a private telephone line six miles long from Bras d'Or Lake to Baddeck. He had three telephones in the house there and a telephone in every building on the place, including one for emergencies in the little cabin deep in the woods where he used to go alone for uninterrupted thought.

P. R. Ridgley Dies

P. R. Ridgley, for years connecting company agent of the Southwestern Bell Telephone Co., died at his home in Steelville, Mo., October 15. Mr. Ridgley died of concussion of the brain resulting from a fall. Mr. Ridgley recently retired from the service of the Southwestern Bell Company.

General Telephone Gains

General Telephone Corp. reports for its subsidiaries a gain of 2,139 company owned telephones for September, 1936, as compared with a gain of 1,237 telephones, for September, 1935. The gain for the first nine months of 1936 totals 15,316 telephones, or 4.90 per cent as compared with a gain of 9,137 telephones, or 3.04 per cent for the corresponding period of 1935. The subsidiaries now have in operation a total of 327,634 company-owned telephones.

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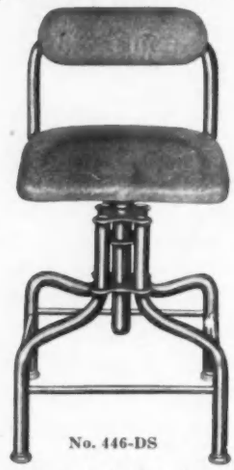
Operator Chairs



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Crapo **Galvanized Products are available in all standard grades and sizes.**

"It Can Happen Here," Says Advertising Man

The following editorial appeared in the weekly publication of the Indianapolis Kiwanis Club and was reproduced by W. H. Beck, secretary, Indiana Telephone Association, in the association's publication. The editorial was written by Jack Harding, Indianapolis advertising man following a visit to Mexico. It is based on fact and has attracted considerable attention, Mr. Harding states.

"Like every man who thinks that he thinks, I try to keep an open mind on controversial matters. Sometimes it is impartiality, at others it amounts to more than intellectual laziness.

"In that spirit I have approached the problem of Communism, trying not to be stampeded into damning a political philosophy I don't thoroughly understand. But if I ever needed complete conversion to the anti-Communistic cause I got it in Mexico. Count me in as a bulwark of rock-ribbed conservatism to do all I can to defeat Red aims.

"The test of any political philosophy is the way it works in practice. I don't suppose there are a hundred men in Mexico who know what communism is and what it strives for, but the mob they incite to action is hideous evidence of the way the Reds go after their objectives. I saw two men killed and seven wounded in a street brawl in Monterrey, when the Moscow trained laborers tried to break up a meeting of ring-wingers. I saw the labor leader walk around with the chief of police and demand the arrest of men who had nothing to do with the disturbance.

"The urge to strikes and violence comes from the top. President Cardenas stands at the extreme left, bitterly attacking industry and the Church, inciting labor to extreme measures. He has surrounded himself with men who think the same way, and the poison filters down to every public office. I saw 'Moscow-trained' laborers. The Soviet had had its best trained operatives at work in Mexico, and they have earned their pay.

"Those boys do things while you and I just talk about it. The greatest enemies to the American system are those good Americans who sit back smugly and say, 'Yes, but it can't happen here.' The hell it can't. Czarist Russia thought the same thing about the proletarian uprising. It happened, didn't it?"

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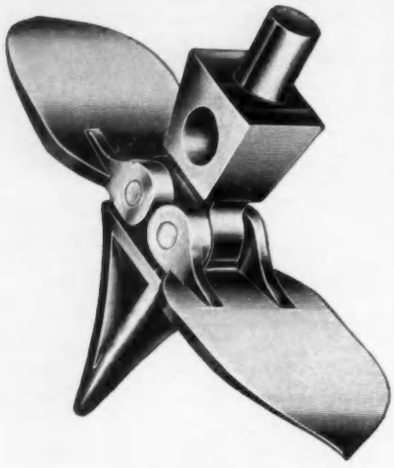

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- MASTERGRIP KABLE KING rodless anchor is designed for use with cable instead of a rod. It is designed and recommended for use on lines where the strain loads vary from 2000 to 6000 pounds, in soils varying from medium sandy to hard or firm.
- A ½ in. hole is provided in the anchor head for the cable. Simply attach the cable and drive into place, using a ¾ in. inside diameter, extra heavy, seamless steel tube.
- Kable King is exceedingly economical to use, as initial and installation costs are low. It is efficient and will give many years of good and dependable service.
- Order the Kable King and give it a trial.

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Three Switchboard Orders For Stromberg-Carlson

The Stromberg-Carlson Telephone Mfg. Co., has just announced contracts for three complete central office installations.

The Carey Electric Telephone Co., Carlson three-position switchboard with universal type cord circuits. The board will be equipped for 380 local central energy lines, 20 rural and 10 toll. Complete central office equipment, including terminal boards, power supply units, etc. are covered by this contract.

The Southwestern Associated Telephone Co., Lubbock, Tex., will install new complete central office equipment in Shattuck, Okla. The switchboard to be installed at Shattuck will be a two-position board with universal cord circuits — 240 local, 16 rural and eight toll lines.

For Churchville, N. Y., the Rochester Telephone Corp., has contracted for new complete central office equipment. The switchboard, in this installation will be a three-position board equipped with universal cord circuits consisting of 260 local lines and 20 toll lines.

$14 Rate "In Advance" Approved By Commission

A rate of $14 a year for telephone service, payable in advance, filed by the Overland Telephone Co., of Strasburg, N. D., has been approved by the state railroad commission.

Declaring that the company has opportunity to protect itself against losses by discontinuing service where rates are not paid in advance, the commission rules that the company could not discontinue service for nonpayment of past due obligations.

Where the company allowed its subscribers to receive service and become in arrears it appears that the company is merely extending credit, and if a subscriber is willing to pay the current charge in advance, the telephone company cannot withhold service until all past obligations have been paid, the commission ordered.

Telephone Gain In Railroad Use

The telephone gradually is supplanting the telegraph in train dispatching, according to recent reports made to the telegraph and telephone section of the Association of American Railroads.

"The telephone," said a statement issued by the association, "on Jan. 1, 1936, was being used in the transmission of train orders over 148,799 miles of road, or 63.53 per cent, while the telegraph was being utilized only over 92,466 miles.

"This is a material change from conditions prevailing in 1920, when the telephone was being used over 119,554 miles of road, or 48.5 per cent, while the telegraph was used over 134,667 miles.

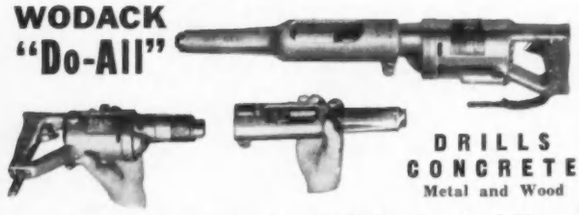
"Particularly has the telephone proved its superiority in emergencies in train operations. By using a way station or portable telephone the engineer or conductor can communicate directly with the train dispatcher or division superintendent, thus giving him more first-hand information in less time than with the telegraph."

Telephone service, both national and international, is growing more popular in Russia. At present, the Soviet Union has telephone communication with seventeen foreign countries, and during 1935, international calls averaged 453 a day, a gain of fourteen per cent over the previous year. The majority of the calls are to France, Germany, Great Britain, Poland, and Latvia.

District Meetings In Iowa

The Iowa Independent Telephone Association has scheduled district meetings as follows: October 27 at Marengo; October 28 at Keosauqua; October 29 at Chariton; October 30 at Corning.

WODACK "Do-All"



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Directly converts Commercial Alternating Current to Telephone Ringing Current.

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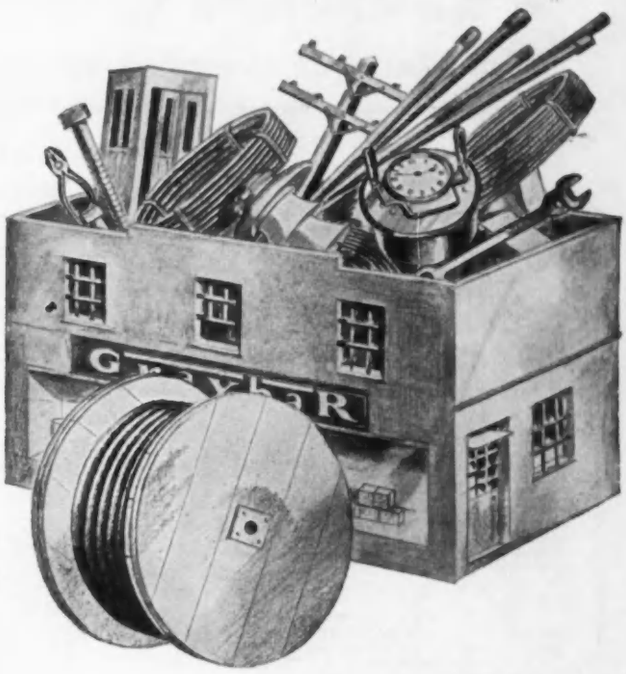

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...and 60,000 other items

WHERE dependability counts—only the highest quality electrical products will do. One such quality product is Western Electric Lead Covered Cable—a cable whose dependability is insured by the most exacting of manufacturing standards.

But that's not all. Out of its roster of 60,000 electrical items, Graybar is prepared to meet *any* need of a telephone industry. And behind *every* Graybar item stands the Graybar reputation for quality that goes back 67 years.

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Should be one who has had the practical experience of Operating, Owning and Managing Telephone Plants. He should be a specialist in Telephone Accounting. He should be able to make up the books in his office from data supplied by you, and at a nominal cost. He should supply the necessary reporting Forms without charge, and be ready to assist you with your various annual Government or State reports. Twenty-five years of this kinu of experience is offered to you.

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Advertising on This Page is Economical
Write for Rates!

Automatic Introduces New Outdoor Telephones

A new line of outdoor telephone sets, for central-battery or magneto service, and incorporating the Monophone hand unit, has been announced by Automatic Electric Co. These instruments are recommended for use as outdoor stations — in industrial plants, lumber yards, cab stands, police systems, etc. — and as indoor stations exposed to moisture, as in dairies, packing plants, etc.

Automatic Electric Outdoor Telephone, closed.

These new telephones employ Automatic Electric Co. standard Monophone hand unit with "all-positions transmitter". The case is made of cast aluminum alloy, finished in black "crackle" enamel, and measures 12" by 8⅝" by 8½" in size. The hinged door is closed tightly against a sponge-rubber gasket by means of a cam-locking handle, for which a key lock is provided. The telephone can be supplied with any desired name molded in the door, if desired.

All wiring is rubber-covered, and ringer coils are impregnated. Ringers in the central-battery telephones may be straightline, or harmonic. The central-battery instrument is furnished with dial for automatic service, or with cover plate over the dial mounting home for manual service. The magneto telephone has generator as shown. Both the central-battery and magneto circuits are of the anti-sidetone tvpe, and "anti-noise" Monophone transmitter can be supplied for use in extra noisy locations.

There are four telephone operators on the new ocean liner, the Queen Mary. Thev work two at a time in four-hour shifts during the day, and in addition there is a young man who handles the switchboard at night when things are not so easy.

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FOR SALE

W.E. No. 137 rebuilt twin operator's plugs 75c

50 W.E. C.B. steel Hotel Sets, enclosed gongs @ ..... $ 8.00

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W.E. No. 315 rebuilt ringer boxes, 3 bar, 1000 or 2500 @ 5.00

Kellogg rebuilt desk stands No. 84 or 118, baked enamel, new cords, one year guarantee @ 5.00

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RECONSTRUCTED EQUIPMENT

1 Western Elec. No. 1801 40 line capacity Common battery P. B. X. board equipped with 30 local lamp lines, 5 cord Ckts., 2 trunks with dial, Hand Gen., etc., all mounted on 3 drawer flat top desk @ $125.00

Western Elec. No. 20AL Desk set with Trans. & Rec. Complete with No. 334 Straight line steel signal set @ 8.25

Western Elec. No. 533 Straight line C. B. Steel hotel set with enclosed Gongs @ 7.75

1 Western Elec. No. 62A Ringing machine operates off from 6 to 8 volts Storage battery, delivers 20 cycle 80 Volts A. C. ringing current @ 10.00

Kellogg No. 729 S. A. Common battery Oak finish Wood hotel sets with Booster Coil @ 6.75

Monarch desk set with Trans. Rec. & Cord complete with 3-bar 1000 or 1600 ohm ringer inside connection signal set $7.85; 4-bar @ 8.75

Leich Elec. Local Battery Transmitters complete with Mouthpiece & back @ .85

Automatic Elec. Slip type Receivers with New Western Elec. Shell & Cord @ 1.05

Leich Elec. Slip Type Receivers with New shell & Cord @ 1.15

Western Elec. No. 122 External post connection Rec. without cord @ ..... .65

Western Elec. No. 21D or E 2 MF Condensers @ ..... .35

REBUILT ELECTRIC EQUIPMENT CO. Not Inc.

1940 West 21st St., Pilsen Sta. Chicago, Ill.

New Line of Safety Flashlights Announced

Inertia Inc., Albany, N. Y., has recently placed on the market a line of gas-tight, water-tight, and explosion-proof flashlights under the trade mark name of Megolite.

These new flashlights are thoroughly insulated against static and dynamic electricity. They are also completely sealed and gasketed against the entrance of water, gases or vapors. There are no external moving parts or switches, the company states.

The company states that Megolites are particularly adaptable for use in all stages of oil and gasoline production, refining and distribution and in the production and transmission of electricity, or around high tension electrical installations.

The switch is a separate unit fully enclosed within the case. This does away with external buttons, slides and knobs of any kind. The light is operated by a simple flick of the wrist, and can be positively controlled even though the hand is heavily gloved, numb with cold, wet or greasy, it is claimed.

The case is completely sealed, without an opening or protuberance in its entire length. Yet it can be disassembled and re-assembled in a few moments without tools, it is said. In industrial models the case is made of durable cohardite, an approved and effective insulating material which is practically indestructible and resistant to weather, fresh or salt water, grease, oil, alkalies and most acids. The complete protection provided by this thoroughly sealed case not only keeps any internal arc from escaping but also prevents inside condensation and prolongs the life of batteries, the company states.

All units of the flashlight, including the switch, are replaceable.

Bell System Station Gain Higher in August

The Bell System reported an increase of 129,000 telephones in service in September, against a gain of 29,100 in September of last year. The August upturn was 68,000 stations against 27,200 in August, 1935. Nine months gain was 610,300, against 298,400 in the 1935 period.

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New Cabinets
Reconditioned Equipment
New Leich Hand Set

3 Bar $13.50
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Index to Advertisements

A

Aiken Anchor Co. 34
Albertson Electric Co. 37
American Steel & Wire Co. 8
Amer. Tel. & Tel. Co. 6-7
Auditorium Hotel 35
Automatic Electric Co. 19-20-21

B

Bartlett Mfg. Co. ..... —
Bashlin, W. M., Inc. ..... —
Berry, L. M. 36
Bowdle Accounting Systems 36
Brach, L. S. Mfg. Co. 36
Buckeye Telephone Supply Co. 38

C

Calculagraph Co. 10
Carney & Co., B. J. 36
Chance Co., A. B. ..... —
Churchill Cabinet Co. ..... —
Coffing Hoist Co. 31
Communication Equipment Engineering Co. ..... —
Cook Electric Co. 26

D

Davey Tree Expert Co. ..... —
Dillon Mfg. Co. ..... —

E

Electric Storage Battery Co., The 27
Everstick Anchor Co. ..... —

F

Forged Steel Products Co. ..... —

G

Gaylord Mfg. Co. ..... —
Gould Storage Battery Corp. ..... —
Graybar Electric Co. 35
Guardian Electric Mfg. Co. ..... —

H

Habirshaw Div., Phelps Dodge Copper Products Corp. 38
Herdrich & Boggs 36
Holtzer-Cabot Electric Co. ..... —

I

Independent Cord Co. ..... —
Indiana Steel & Wire Co. 32

K

Kearney Corp., Jas. R. 23
Kellogg Switchboard & Supply Co. 2-3
Klein, Mathias & Sons 30

L

Larkin & Co., John C. 36
Leich Electric Mfg. Co. 25
Lenz Electric Mfg. Co. 31
Littelfuse Laboratories 34
Loomis Advertising Co. 31
Lorain Products Corp. 8

N

National Carbon Co. 9
National Telephone Supply Co. 8
North Electric Mfg. Co. 40

O

Owens-Illinois Glass Co. ..... —

P

Phillips Electric Works, Ltd., Eugene F. ..... —

R

Ray-O-Vac Co. 32
Rebuilt Electric Equip. Co. 37
Reliable Electric Co. 28
Russell, C. B. 36
Runzel Cord & Wire Co. 31

S

Seymour Smith & Son, Inc. ..... —
Shallcross Mfg. Co. ..... —
Siemen Bros. & Co., Ltd. 8
Stewart Bros. 38
Stromberg-Carlson Tel. Mfg. Co. 4-39
Sturgis Posture Chair Co. 32
Sundt Engineering Co. 33
Suttle Equipment Co. 33

T

Telkor, Inc. 35
Telephone Repair Shop 37

U

Union Carbide & Carbon Co. 9
Unique Mfg. Co. ..... —

V

Valentine & Clark Corp. 36

W

Western Electric Co. ..... —
Whitney Blake Co. 33
Williamsport Wire Rope Co. 29
Wodack Electric Tool Co. 34
Wopat, J. W. 36
Wray, J. G. & Co. 36

Y

Yale & Towne Mfg. Co. ..... —

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